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MARKETS, TRADE AND INSTITUTIONS DIVISION

March 2006

MTID Discussion Paper No. 92

Food Policy Liberalization in Bangladesh: How the Government and the Markets Delivered?

Nuimuddin Chowdhury, Nasir Farid, and Devesh Roy

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ABSTRACT

Three factors, advent of new technology (HYV), development of infrastructure and market liberalization working in tandem have delivered favorable food security outcomes for Bangladesh. Bangladesh's food-policy has benefited from a liberalized trade regime and a consistent downsizing of the government, all with favorable effects on poverty and nutrition. Post liberalization, the findings suggest a perceptible increase in the cost-effectiveness of the public food grain distribution system (PFDS). The favorable effects of liberalization are also evident in growths in outputs, market size, the size of private stocks, the emergence of a two peak harvest seasonality, and finally in declining real rice prices. The government has moreover downsized the PFDS, making poverty-reduction a priority basis for grain allocation. While imports relative to total availability have remained virtually unchanged during the last 25 years, public issue relative to the availability has fallen by about a half. Average food grain consumption has fallen slightly during the 1990s but in face of rising incomes, this could partly be driven by diversifying tastes. Comparing the efficiency of the private and the public sector, the private marketing margin is slightly higher. In spite of the significant advantage(s) enjoyed by the public sector, the margin being thin is significant. In order to account for the expected global changes under the Doha round, simulations using competitive spatial-equilibrium models for the world's rice and wheat markets forecast increase in prices for rice and wheat by 21.7% and 10.1% respectively by 2013. USDA global CGE models (2001) show figures of increase in wheat prices by 18.1%, and rice prices by 10.1%.

These estimates are used in a multi-market model for Bangladesh as estimates for global price shocks. Sensitivity analysis shows that over a range of values involving both an upper and a lower limit, small declines will occur in real incomes and caloric levels of both urban poor and rural landless households, while large farms will experience a small gain in their real incomes. Based on values corresponding to the lower limit, overall effects on food security are however quite small.

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LIBERALIZATION AND FOOD SECURITY IN BANGLADESH: HOW THE GOVERNMENT AND THE MARKETS DELIVERED?

Nuimuddin Chowdhury¹, Nasir Farid ², and Devesh Roy³

1. INTRODUCTION

The common perception of Bangladesh is of a flood prone poor country beset with acute governance problems. Despite these perceptions, Bangladesh has done well in some important aspects. In particular, Bangladesh has done fairly well in managing its food and agricultural policies over the last quarter of a century. The policies, especially those pertaining to liberalization, agricultural R&D and physical infrastructure building have created notable gains and one of the highest growth rates in the size of food grains markets in South Asia.

Government interventions in food grain markets in South Asia were formed against a backdrop of the infamous Bengal famine of 1943 in which millions died. The driving policy mindset was since conditioned by (a) a low production base of rain-fed, fragile mono-crop staples cultivation (b) fragmented infrastructure, financial and informational networks; (c) thin market supplies displaying high prices, large seasonal spreads in prices and susceptibility to upward spikes at short notice. In 1950/51, Bangladesh's rice production per capita was only 60% of 2000 and the seasonal spread in

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rice price was greater than 40%. Scarcities were rife and crop failures often brought dreadful political fallouts. The interventions thus resulted from a syndrome of scarcity, pre-dating the green revolution. Conceived by the bureaucrats and politicians with the probable backing of wholesalers, (with typically high incidence of leakage, they were *de facto* beneficiaries of subsidies on food grains), the public distribution system was expansive, expensive, hugely loss making but yet a political holy-grail.

The technologies, infrastructure and the markets have come a long way in Bangladesh since the shadows of famine and starvation (Ahmed, Haggblade and Chowdhury, 2000). Importantly, the governments have evolved in their mindset alongside. In the new millennium, the liberalization of agricultural markets has also started taking a global dimension with the launch of the Doha Round. Any discussion of food policy in Bangladesh must therefore deal with these expected changes in the global trade regime.

Bangladesh government, bowing to the general trend of liberalization, began to liberalize extensively since the early 1990s. Prior to that, plant-breeding research and infrastructure development were accelerated throughout the 1970s and the 1980s. Border protection on manufactured goods was lowered earlier. Both agricultural inputs and output markets were liberalized between 1988 and 1993; private imports of fertilizer and both grains (rice and wheat) were legalized in 1993; anti-hoarding act was put into abeyance and private traders could now seek institutional credit for carrying inventory.

This paper attempts to assess the fallout of these policy changes on food security in Bangladesh. It analyzes the evolution of the food policy and outcomes in Bangladesh

in terms of the policy transition and the changes in private and public response to the changes. The discussion points to highly favorable responses of the private sector to the actions by the government. The responses of the private sector to liberalization are manifested in terms of growing food grain output, increasing size and commercialization of rice markets, private rice stocks becoming the mainstay of Bangladesh's sourcing of grain requirements and the near take over of the rice imports by the private sector after the legalization of private imports. Next, it discusses the behavior of rice and wheat prices in terms of their trends, inter-year variability and intra-year seasonality. These variables are important indicators of food security and it is important to assess their behavior post liberalization to evaluate the food security outcomes from liberalization. Liberalization has resulted in a much greater role of the private sector. The comparative analysis of the public and private sectors shows that the private sector is comparably efficient in terms of marketing margins.

Further, the paper analyzes the potential impact of the Doha round negotiations on the food security outcomes in Bangladesh. Simulations using competitive spatial-equilibrium models for the world's rice and wheat markets forecast increase in prices for rice and wheat. The estimates of price increases are used in a multi-market model of Bangladesh as estimates for global price shocks. Sensitivity analysis shows that over a range of values involving both a upper and a lower limit, small declines will occur in real incomes and caloric levels of both urban poor and rural landless households, while large farms will experience a small gain in their real incomes. Based on values corresponding to the lower limit, overall effects on food security are however quite small.

The paper is organized into seven sections. Section 2 documents the response of the public and private sector to the changing policy regime. Section 3 looks at the prices of rice and wheat in terms of their trends, inter-temporal variability, seasonality and comparative (relative to international benchmark prices) variability of rice and wheat prices in Bangladesh. Section 4 presents the food security outcomes in terms of national aggregates of food consumption and also in terms of the equalization of consumption across incomes classes. Section 5 compares the public and private sector average marketing margins incorporating several relevant dimensions like operating scales and capitalization, inventory-to-turnover ratio and government-failure issues. Section 6 presents the results of a modeling exercise to ascertain the prospective impact of the Doha Round on world rice and wheat prices. Subsequently, a multi market model is used to trace the effect of those price changes on Bangladesh economy. Section 7 presents the summary and major conclusions from the paper.

2. CHARACTERIZATION OF BANGLADESH'S FOOD GRAINS ECONOMY

Table 1 marks the transition of Bangladesh's food and agricultural policy during the period of 1979-2004. Based on the components of policy transition, it is accurate to say that Bangladesh has elements of pro-poor economic growth and an active green revolution led by high-yielding rice varieties, large investments in physical infrastructure including irrigation and ready availability of fertilizer. In this respect, Bangladesh mostly shows similarities to Indonesia (Timmer, 2004).

Table 1—Milestones in agricultural and food policy transition, 1979 – 1996

Date	Important milestones
September, 1979	The World Bank produced an important document, <i>Food Policy Issues</i> (World Bank 1979) that framed all the major policy and analytical issues in managing Bangladesh's food sector. The report cited optimal national stocks as equal to 1.5 million metric tonnes (MMT) as on July 1 of every year and 1.2 MMT as on Nov. 15 of every year. Security stocks the size of 600,000 MT were cited as "appropriate".
1981	With the launch of the country's Second Five Year Plan, government adopted an ambitious long-term plan for accelerating the growth rate of rice production.
1982	Food Policy Monitoring Unit (FPMU) is established based on the recommendation in the Food Policy Issues.
1986	A study led by Beacon Consultants that carried out the first-ever evaluation of the welfare effects of both Statutory Rationing and Modified Rationing demonstrated the inequities of the operation of both channels.
1988	Pursuant to PL-TITLE III signed in 1988, Open Market Sales (OMS) came into vogue in Bangladesh. Now, in the event of the market price rising over a meaningful threshold, OMS grains would get disproportionately distributed in poor neighborhoods in order to foster self-selection of the grains being off-loaded. In July 1988. The government waived the standardization requirement on imported irrigation equipment, thus allowing cheap imports from China and South Korea. This change is largely believed to have decisively spurred the growth of rice production.
1989	<p>The Modified Rationing (MR) was replaced by Palli Rationing under which rice was no longer to be distributed in rural areas but wheat would be distributed to small milling units. Each licensee mill would receive about 500 kgs of wheat per month: they would then sell the <i>atta</i> to villagers at a pre-set price; The government instituted Palli Rationing to distribute subsidized food grain (at 25%) to eligible households in rural areas. PR soon became the single most important public distribution channel for rice. Significantly, the PR was poorly targeted (Ahmed, 1992). It distributed rice during all months, including harvest ones.</p> <p>March 1989. Direct sales of urea by parastatal fertilizer factories to private traders was allowed for the first time, enabling a rapidly increasing number of private traders to move large quantities of urea across the country (Samad et al. 1989). Previously, wholesale urea trade was a parastatal monopoly.</p> <p>The government started a new procurement program called mill gate Purchase (MP). The idea was to procure milled rice from pre-qualified contractor-mills at a cost-plus basis that pivots around the "procurement price" (PP). For a marketing agent, access to a MP contract readily implied secured access to implicit credit subsidies (Chowdhury, 1994). Also, the PP easily exceeded the going price during procurement season, due to the generous provisions of the scheme (such as highly favorable milling ratio). The MP was a lucrative for mill-owners who received qualification. Rice procurement rose during 1989/90 to 1991/92 to record levels.</p> <p>1989/90. The government procures record quantities of rice during both aman and boro seasons. Millgate Purchase (MP), highly profitable to the contractors distorted incentives in milling and trade. Previously all millers and traders competed in one national rice market, the MP created incentives for local rent seeking.</p>

Notes: This table includes only landmark food policy changes. After 1996, it can be argued that there are no policy changes with far reaching impact on food markets.

Table 1—Milestones in agricultural and food policy transition, 1979 – 2004 -con't.

1991	The government suspends PR. This aggravated the public rice stocks to swell as well. PP was raised to Tk. 240, even though the single most important distribution channel had been terminated.
1992	Statutory Rationing (SR), which entitled each card-holder to weekly grains from licensed dealers within the limits of six SR cities, was abolished. The abolition was received without any public outcry, indicating that there was a realization of mistargeting among the masses. Private imports of fertilizer of all types were legalized for the first time.
1993	Import of wheat by private mills was legalized. Imports of foundation seeds and power-tillers were liberalized.
1993	Private wheat imports by licensed large mills and private rice imports were legalized.
1994	The 50 year old <i>anti-hoarding act</i> barring merchants from keeping inventories exceeding 1 week working stocks without statutory licenses from the Food Department was put into abeyance.
1996	Bangladesh implements the Uruguay Round Agreement on Agriculture. Tariff rates were bound at a much higher level relative to where they were applied. Bangladesh's aggregate measure of support was way below the <i>de minimis</i> level as per WTO rules

The liberalization of the fertilizer and minor irrigation equipment occurred during 1988-1992 (Table 1). These twin reforms produced a concentrated impact and provided a significant fillip to the area under irrigation during the dry season resulting in a positive rice output response.⁴ The trend growth rate in rice production of 2.98% during 1981 – 2004 outstripped population growth and the growth rate was substantially higher in the post-liberalization period. Similarly, the trend growth of 2.7% in overall food grains production outstripped population growth rate. Per-capita market supply of rice grew at 1.3% during 1981-2004 (Table 2), while the corresponding number for all food grains was 0.91% (largely because the supply of wheat was lagging behind). The share of boro rice in the total has grown rapidly while the share of aman rice has declined (Chowdhury 1994).

⁴ This phenomenon has been widely documented; see Hossain (1988), Ahmed (2000) and Dorosh et al. (2004).

Table 2—Growth rates in pre- and post-liberalization periods (%)

Growth rate of rice and all-food grains	1980/81- 1992/93	1993/94- 2003/04
Rice production	2.61	4.78
Rice market supply	2.68	4.83
Food grain production	2.46	4.66
Food grain supply	2.3	4.61
Rice supply per capita	0.47	3.21
Food grain supply per capita	0.148	3.063
Import ratio of national food grain availability	10.4	10.2
Public distribution as % of national food grain availability	12.5	7.1

Source: DAM and FPMU

Treating 1992/93 as the start of liberalization, the post-liberalization period has witnessed acceleration in the growth of supply as well as production. In most cases, there is almost a doubling of the growth rates post-liberalization. While the share of public distribution in national availability of food grains has fallen in the post-liberalization period, the share of food grain imports has remained virtually unchanged. The lion's share of the food grain imports post liberalization comprised private imports.

The rice yields in Bangladesh have grown at 2.69% annually while area growth has been 0.02% a year.⁵ In case of HYVs, in contrast, the dominant factor has been area growth. Segregating yield growth performance between high-yielding varieties (HYVs) and all rice among the three major strains (*aus*, *aman* and *boro*), there are noticeable differences in the growth experience. For all three strains, the HYVs are outpaced by the

⁵ All India rice yield rates for a similar time-period is also 2.67%.

all-rice categories.⁶ The seeds-water-fertilizer revolution appears to be slowing down.

Industrialization and housing boom are also weaning land away leading to a decline in arable land. Rising crops yields is what Bangladesh needs now.

2.1 PRIVATE SECTOR'S RESPONSE THROUGH CHANGING LEVELS OF COMMERCIALIZATION

Market supply for food grains per capita exhibits a strong positive trend, the main reason being higher than average growth in rice at 1.17% a year. Public issue of all grains as a percentage of availability shows a negative trend suggesting that the food distribution in Bangladesh has been overwhelmingly privatized following liberalization.

The favorable supply performance has been due to a dramatic increase in the proportion of rice output that is marketed leading to a fairly rapid expansion in the size of the market (Table 3). Between 1980 and 2003, the size of the rice markets has grown by about 10 million tonnes. During the same period, the nominal price per ton has risen by Tk. 6110. As a rough approximation, in value terms, the market has grown by Tk. 61.1 billion. In 2003, the total number of farms in Bangladesh was estimated to be 13 million. This translates to a per farm expansion in value terms equal to Tk. 6000 at average price levels prevailing during the last 20 years. This was bound to provide a powerful stimulus towards rice's commercialization.

⁶ The *relative levels of* returns to land or family labor however still tend to be higher for the HYVs despite the *lower yield growth rates* for them.

Table 3—Broad changes in Bangladesh’s rice markets

Dimension	1960s	1970s	1980s	1990s	2003
Output and its aspects					
Level (million tonnes)	10	12	15	18	23
Boro share (%)	7	18	26	38	52
HYV share (%)	1	23	36	63	80
Quantity marketed					
Level (million tonnes)	1	3	5	9	15
Percentage share in output (%)	12	27	34	49	60
Per capita (kgs)	20	41	51	76	109
Public share of rice supply (%)	30	15	11	7	6
Share sold on the farm itself (%)	28	n.a.	n.a.	66	> 66
Number of marketing agents					
No. of traders	4000	n.a.	n.a.	48000	> 48000
Millers					
Automatic	0	3	66	88	n.a.
Major	106	152	251	480	n.a.
Husking mills	6049	11437	43374	50300	n.a.
Total	6155	11592	43691	50868	n.a.
Private rice stocks					
No. of months of consumption needs	1	n.a.	n.a.	3	n.a.
Average storage time for trader stocks (months)	4	n.a.	n.a.	1	n.a.
Typical distance of spatial arbitrage (miles)	50	n.a.	n.a.	100	n.a.

Source: Chowdhury (1992); Chowdhury and Haggblade (2000); MOF/FPMU data; authors’ own calculations; Note: n.a. indicates that no recent survey data are available.

Several studies (Chowdhury (1992) and (Dorosh et al., 2004) have related these changes to the change in the structure of rice output, the rising share of irrigated rice which is more intensive in purchased inputs and the increase in business confidence that it spawned among farmers. Chowdhury (1994) showed that the rice production seasonality changed from being single humped in the November-January stretch to double humped, the other being in May-July stretch. From less than 15% in the early 1970s, the percentage of overall rice output harvested during the boro season (May-September) rose to more than 65% in the 1990s. The HYVs are very cash-intensive. Not surprisingly, they motivate greater marketed surplus. Also, as pointed out in Dorosh et

al., the production stabilization through the two humps increased the farmers' economic confidence.

During the quinquennium to 1969/70, 62% of the annual rice output was harvested in December-January while the next sizeable rice crop was harvested in September. Rice prices then were the lowest in December and the highest in August-October. Three decades later, thanks to the diffusion of boro rice HYVs, the December harvest's proportionate share has shrunk to under two-fifths while nearly 50% is harvested between May and August. A large part of that season between August-September used to be the hungry season with high rice prices and high incidences of malnutrition (Chen, et al. 1979; Clay, 1981). Thanks to the large and growing boro harvests, that hungry season has been converted to a benign harvest season.

In recent times, the price seasonality has become bimodal, with one peak in March-April and another in September and October. As seasonal price spreads have fallen in the late 1980s, 1990s and thereafter, storage for inter-temporal arbitrage has increasingly become less profitable. The typical storage period has fallen significantly, from about 4 months in the late 1960s to about one month in 1989/90 (Farruk, 1972, Chowdhury, 1992). With the reduction in duration of storage, there was a certain weakening of finance as a source of competitive strength.

As the pace of urbanization increased, new growth centers came up making arbitrage over space more profitable. Effective distance was also shortened because of the development of transportation infrastructure. Satellite population centers came up outside two mega cities, namely, Dhaka and Chittagong. In the changed scenario, information

about sources and destinations, and the ability to physically negotiate the distance became the chief differentiator among farms. Amid the new reality, labor and not capital became the source of competitive strength.

Growing farm surpluses created a new breed of traders to channel the surpluses to the market. Back in 1990, Chowdhury (1992) found that the farmers sold two thirds of their marketed output at the farm gate through marketing agents. These agents operated with little capital (Chowdhury and Haggblade, 2000) and probably represented one of the most labor intensive rice trading regimes in Asia. Importantly, the army of rice traders had emerged without any government initiative. Informal delivery chains including trade credits also emerged alongside to service the growing needs of finance of the traders with little personal capital (Chowdhury, 1994; Chowdhury and Haggblade, 2000). Just as there is evidence of no distress selling of surplus rice, there is no evidence of rent seeking in loan market. Again, the private sector seems to have delivered (Chowdhury and Haggblade, 2000). The government did play an important facilitating role by investing in physical infrastructure (expanding network of highways, major arteries and rural roads). The government initiatives on this front ensured that small and marginal farmers were a part of the commercial changes.⁷

Growing production of grains, an improving infrastructure and greater farmer confidence in marketing resulted in rising marketed surpluses, which enabled seasonal smoothing and spatial integration of markets. The uniformity in the seasonal pattern of

⁷ This account has been related by Chowdhury (1992, 1994), Chowdhury and Haggblade (2000).

marketing can be seen in Table 4. Given widespread HYV adoption by farms of all sizes, a large proportion of even marginal farms (those owning up to 0.2 hectare of land) became net sellers of paddy in good harvest years. After good aman and boro harvest during the 1989/90 crop year, an estimated 70% of all farms were net sellers of rice (Chowdhury, 1994).

Table 4—Coarse rice and seasonality of farm rice marketing, Bangladesh, 1990 (kgs)

Month	Marketing per farmer by month by grade (all milled rice)		
	Coarse rice	Non-coarse rice	% of coarse rice in total marketing
November	417	156	72.7
December	294	135	68.5
January	219	145	60.1
February	246	126	66.1
March	219	150	59.4
April	420	202	67.5
May	915	134	87.2
June	469	74	86.3
July – August	591	136	81.3
September- October	506	141	78.1
All Months	4315	1399	76.0

Source : BFPP Farm Survey

There is reasonable empirical evidence that supports the hypothesis that food markets in Bangladesh are spatially integrated. If trade occurs between two markets and the price in the importing market equals that in the exporting market plus transport costs to certain approximation, then the two markets are spatially integrated. Dawson and Dey (2002) test for long-run spatial market integration between two prices (of rice) using a dynamic vector autoregressive model and cointegration. Their paper uses monthly prices

on wholesale rice markets in Bangladesh since trade liberalization in 1992. Following Ravallion (1986), Dawson and Dey (2002) assume a radial market structure where there is a group of local, regional markets and a central market in Dhaka. The regional markets chosen are those in Bogra, Comilla, Faridpur, Jessore, Khulna, Kustia, Mymensingh, Noakhali, Pabna, Rajshahi and Tangail. All these regional markets are within about 170 miles by road/ferry. Trade between regional markets does exist but trade with the central market dominates price formation and accordingly Dawson and Dey examine 11 pair wise relationships between prices in Dhaka and those in regional markets. The hypothesis tested is that of perfect market integration where a price increase in one market leads to an equivalent effect in another.

Previous studies of rice market integration in Bangladesh examine the pre-liberalization period prior to 1992 and conclude that there is limited integration, Ahmed and Bernard (1989) and Goletti (1994)). Dawson and Dey (2002) in contrast find that since liberalization, the law of one price holds between the rice prices in Dhaka and each regional market and this spatial market integration is perfect so that a price change in one market is mirrored elsewhere. In its relationships with near markets, Dhaka is dominant whereas in its relationships with more distant markets, regional markets dominate.

The IDS report (1998) titled “ The Spatial Integration and Pricing Efficiency of the Private Sector Grain Trade in Bangladesh” arrived at a similar conclusion albeit including wheat markets as well. In the study along with rice, wheat markets were also found to be spatially well integrated, with the extent of integration improving since 1992. The study attributes this spatial integration to grain market liberalization along with the

investments in the road and telecommunications infrastructure. This study that analyzes the changing marketing chains finds that millers and wholesalers in the procurement regions are increasingly bypassing traditional marketing intermediaries and selling directly to wholesalers in terminal markets. This shortening of the marketing chain has important implications for spatial integration of the markets.

2.1.1 The ascendancy of the private sector

The efficiency of the private sector is likely to be higher when the extent of commercialization is high, the growth of infrastructural networks is extensive, entry barriers are small and trading is labor-intensive so that small traders can also be a part of the market. In the 1990s, these enabling factors have improved. Technological change fostered greater commercialization but also the road kilometerage, the number of trucks, the number of telephone connections i.e. the availability of infrastructure went up. The marketing costs of suppliers at each level fell as a result of these improvements. For instance, in 1990, a long-distance call from Thakurgaon in the North-West of the country to Chittagong, an important terminal market would cost Tk. 30/minute. In 2002, such a call was only Tk. 6/minute. Similarly, the opening of the Jumna Bridge lowered the travel time between Dinajpur and Chittagong by one-half.

The ingredients of what we prefer to call a marketing revolution were increases in the volume of private stocks, narrowed period of temporal arbitrage among rice traders and a widening of marketing outreach for an average arbitrageur. Chowdhury (1992) showed that per capita private rice stocks roughly doubled between 1960s and the early

1990s. In absolute terms, private rice stocks have grown faster, particularly since the late 1980s. In the lean season, just before the *aman* harvest, private rice stocks typically exceed those held in government godowns by about a factor of three. During the early 1990s, in the post-harvest months of January and June, private rice stocks alone exceed total government food grain stocks by a factor of five. Among private holdings, farm stocks dominate. On-farm stocks account for about 75% of all holdings, while trade stocks account for the remainder (Chowdhury, 1992).

The main messages from Table 5 are two. First, by 1990, the marketing of rice had turned out to be fairly even across classes of farms and across months in the market year. Secondly, there is evidence for no distress selling by the farmers. If there were distress selling by marginal and small farmers, the percentages sold in the months away from the main harvest(s) would have fallen sharply compared with the harvest months. The clear implication is that growing rice in Bangladesh had become a profitable business, and that marginal and small farmers have been included in this propitious development.⁸

⁸ Even though our finding is based on an old survey in 1990, similar conclusions have been reached by other authors using more recent data. Dorosh et al. (2004) write: “All farm size-classes sell at least a half of their rice output. The price of rice during the harvest season is therefore a major determinant of farmers’ incomes”.

Table 5—Farm marketing of paddy, the year through November 1990 (percent of quantity marketed)

Farm size classes	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Total
Marginal Farms	11.29	11.94	7.79	12.0	2.51	15.6	15.31	8.4	8.61	3.85	1.6	0.8	100
Small Farms	9.41	6.13	6.15	10.6	7.09	11.1	14.11	7.1	6.65	14.1	3.9	3.2	100
Medium Farms	9.35	5.98	5.28	11.0	10.26	9.85	15.42	9.8	5.78	5.36	6.2	5.5	100
Large Farms	8.67	7.00	5.76	11.5	10.42	9.45	16.94	8.0	4.67	6.79	5.0	5.6	100
All Farms	8.92	6.69	5.67	11.3	10.09	9.72	16.32	8.4	5.13	6.92	5.2	5.4	100

Source : BFPP Farm Survey

The overall private stocks had risen both in absolute terms but also relative to total estimated food grain stocks during 1989-1994. This is true for the stocks in October (the end of the *kharif* season), January (the end of the aman harvest season) and June (the peak of the boro harvest season). Private stocks relative to public food grain stocks (both rice and wheat) range from a low multiple of 1.25 in the month of October to a high of more than 4.5 during June. Private stocks supplied in 1994, on an average equate to more than 3 months' of food grain requirements in Bangladesh. In the second half of the 1960s, this used to be one month's requirements.

2.2 ADAPTABILITY OF THE PRIVATE SECTOR IN BANGLADESH RICE ECONOMY

When given an opportunity through public investment on agricultural R & D and physical infrastructure, the private sector delivered. Once again, when faced with an opportunity to take advantage of international trade, the private sector showed its mettle. In the wake of the disastrous flood in 1998, (large output losses in 1998/1999), the dire need was to augment market supplies of parboiled coarse rice quickly and cheaply.

Within a period of 9 months, as much as 2.4 million metric tonnes (MMT) of rice were imported by the private sector following the floods. Ironically, less than one year from the floods of 1998 and the concerns of food shortages and high prices, low rice prices dominated the short-term food policy debates throughout 1999-2000. Bumper crops of wheat and *boro* rice in the first half of 1999 brought large surpluses to markets leading the Ministry of Food to increase procurement targets. It resulted in a large build-up of government stocks (Dorosh et al., 2004).

In legalizing private imports, the government was stepping across a major psychological barrier. There were two years when production shortfalls were large due to flood-induced losses to standing crops or seedbeds during the aman season in, 1995/96 and 1998/99. On both occasions, the prices rose raising expected profits to importers. Immediate response by a large number of importers, each opening letters of credits (L/Cs) for fairly small quantities of rice helped import large quantities of rice within a very short period of time.⁹ Importantly, the rice importers had little overlap with the established rice wholesalers or millers. The new opportunity triggered the entry of an entirely new set of marketing agents. Their large numbers ensured that the market was highly competitive.

⁹ IFPRI FRSMP project showed that a large proportion of the *letter of credit* (L/C) opened by private importers are small in amount, of less than 500 MT. L/Cs opened during both 1994 and 1998 suggest a large number of traders imports. Average quantity of rice imported per consignment fell between 1994 and 1998. The ten largest traders imported 142,369 tonnes, 16 percent of the total. The structure of the rice import trade was atomistic, with very little real possibility favoring existence of price collusion among so many importers.

Since private imports were legalized, markets selected India a source of choice. Between 1998 and 2004, the percentages of public imports in rice and wheat have fallen sharply but India has remained a major source of imports. India is a next-door-neighbor, had a large and growing public food grain stock and was a major producer of parboiled rice, the variety that is preferred in Bangladesh. The Indian rice according to this enjoyed an advantage (in terms of the import parity price) of 10-16% over the nearest competitor in the period after 1998 flood. Since private imports were legalized, private importers and government/donors have switched their market shares. From a one third share in imports in the mid-1990s, private imports have become the mainstay of imports recently.

2.3 THE STRUCTURE OF PUBLIC SUPPLIES OF FOOD GRAINS

Public supply of food grains has three main sources in Bangladesh: domestic procurement, imports and changes in government stocks. We show the changing structure of relationships between issue price (IP), procurement price (PP) and wholesale market price (MP) of food grains. The moving averages of the ratio of procurement-to-market price for both grains show a significant positive time-trend. Ratios greater than unity point to greater government efforts to pack incentives in the PP.¹⁰ Likewise, the ratio of issue price to market price too show a significant positive time-trend.

The government's effort to corner larger absolute quantities of rice and wheat through its procurement program has succeeded since the early 1990s: the quantities

¹⁰ A relative lowering of PP to MP also reflects the downward movements in market price itself (for instance, based on declining international rice prices).

procured have tended to increase. The proportion of wheat output intake through procurement took an upward turn recently and the same, albeit to a smaller degree applies to rice. As a result, domestic procurement has become the source of choice in feeding the Public Food Grain Distribution System (PFDS).

All public supply of food grains is the preserve of the PFDS. As Table 6 shows, the distribution system costs the government between 3 and 4% of the total public expenditure. The overriding objectives behind the PFDS are: feeding priority channels; price stabilization; targeted interventions in poverty reduction; and security stocks.

Between the mid-1980s and mid-2000s, the share of public distribution in market supply shrank from 13% to 5.2%. In terms of the relative importance of the three sources of public supply,¹¹ during 1999/2000-2002/03, the share of procurement averaged 82%. The government has increasingly relied on domestic procurement, especially of rice, in the 1990s.

¹¹ From the balance equation for stocks, we know that off take and open-market sales by the government are driven by changes in stocks, imports and procurement. Whenever there are discrepancies between the share of imputed sources and the actual, they are often due to unreported stock losses and from omissions.

Table 6—Food subsidies relative to expenditures (All values are in Tk. Billions)

Year	GDP	Revenue Expenditure	Development Expenditure	Total Public Expenditure	Food Subsidy Per Govt. accounts	Food Subsidy (All valuation being on market prices)	Food Subsidy As % of public Expenditure in B'desh	Food Subsidy As % of public Expenditure in India
1999/2000	2370	181.95	152.21	344.6	3.69	n.a.	n.a.	3.03
2000/2001	2535	205.36	159.01	374.0	3.34	8.25	4.0	2.88
2001/2002	2732	227.0	150.5	407.6	3.35	9.47	4.2	4.41
2002/2003	3006	253.07	169	439.04	4.64	n.a.	n.a.	n.a.
2003/2004	3326	289.69	203	519.8	3.03	8.77	3.0	n.a.

Source: Bangladeshi numbers are from the Ministry of Finance (various years), and Indian numbers are from Government of India (2002)

There has been a significant decline in the role of imports. The percentage of imports in total public distribution had averaged 90% over the period from 1972/93 to 1989/90 (Goletti et al., 1991). That fell to 58% during 1992/93–2002/03. If it were not for the large imports during 1995/96 and 1998/99 (in the wake of floods), the relative importance of imports would have been even smaller.

Public distribution essentially involves two kinds of channels, sales and non-monetized. The difference is whether supplies lead to any financial *quid pro quo* into the DGF or not. The components of priced distribution are essential priorities (EP), other priorities (OP), open-market sales (OMS) and Large Employers (LE).¹² EP caters to the employees of the Armed Forces, the para-military border forces (the BDR), the police, the “Ansars” (another para-police cadre of armed security men). These public servants are treated as special cases.¹³ The issue price for this category has not been revised during the last ten years. EP alone accounts for the lion’s share of the food subsidy each year. The OP caters to the employees of Civil Defense Forces and some other strategically influential groups. Through LEI, the government allots grains to large registered manufacturing enterprises (with more than 100 employees) in the SR areas.

Non-priced distribution is motivated by poverty-reduction objectives and includes programs such as *food-for-work program (FFWP)*, *vulnerable group feeding (VGF)*,

¹² Statutory rationing (SR), Modified rationing (MR), Palli rationing (PR), and the monetized channels have been abolished.

¹³ The subsidies to the EP recipients is classified information but is expected to be high. After 1992 when SR was abolished, EP is the only channel in which grains are shipped by the DGF at a fraction (of between 10 and 20%) of what the DGF calls the economic price of the grain.

*vulnerable group development (VGD), and canal digging (CD), test relief (TR), gratuitous relief (GR), and food for education (FFE).*¹⁴ The Food-for-education (FFE) introduced in December 1993 was phased out in December 2001. Under this scheme, in-kind nutritional supplements were being given to households that had children at school. CD, TR, GR operate mostly after some natural calamity.

2.3.1 Reforms in Bangladesh's PFDS

In the 1980s and early 1990s, there was a spate of policy work exposing the inequities in the SR, MR and OP (Beacon Consultants, 1986; Chowdhury, 1988a, 1988b, Ahmed 1992). Two of the inequitable channels were phased out in 1990/91 and in 1991/92 with almost no resistance from the public. Given the special interests that this system breeds over time, the near absence of public opposition to such a change was remarkable.

The government has since been pushing rice into FFW, VGD/VGF, TR/GR, FFE, even canal digging. From one-tenth of total rice distribution in the 1980s, these channels have accounted for more than three-fifths of all public rice off take since 1997. It is unclear whether from a food security perspective this is a positive development or not. However, few considerations apply. First, in Bangladesh, rice cannot compare with wheat's attractiveness as a public-intervention commodity since consumption levels of rice without-intervention is likely to be high even for low-income households. Thus, any

¹⁴ FFE has since been abolished late in 2001. FFW also witnessed a roll-back in the quantity allotted to it in 2002.

intervention quantity is almost certain to be infra-marginal. Intervention with infra-marginal quantities leads only to an income effect when the intervention is well-targeted.

On the other hand, if wheat is the public-intervention commodity and is well-targeted, the impact would be *extra-marginal*. The changeover to rice (from wheat) in FFW and VGD was presumably regressive on grounds of equity. Secondly, compared with wheat, rice's marketing chain is truly national. The transaction cost of selling grain for cash relative to unit sales is certainly higher for wheat. One possible reason for the selection of the grain could be the falling food aid. The government was determined to push ahead with domestic procurement of rice even though two channels generating retail demand for rice had been scrapped. It had no option but to force-feed the rice that was procured through the unconventional channels, despite the risks of more leakages.

2.3.2 *The cost-effectiveness of the existing system*

Cost-effectiveness refers to efficacy relative to the input, usually defined as a ratio, the numerator an estimate of benefits and the denominator an estimate of costs. Thus, cost-effectiveness measures how much does it cost to transfer a unit subsidy to target groups.¹⁵

In case of food grain interventions, this has been done in the following two main ways. First, studies carried out by IFPRI during 1993 provided estimates of cost-effectiveness of income transfers from targeted interventions programs (Working Group

¹⁵ For an example of this approach, see Ahmed (1993).

on Targeted Food Interventions 1994). A variation was implemented by Ahmed who asked the following question to measure effectiveness: do beneficiaries of targeted interventions have higher marginal propensity to consume out of the dollar received as wheat ration compared with cash income? If they do, this would make a food-based program more effective in providing nutritional support than an equivalent payment in cash (Ahmed, 1993).

The second approach is expounded by Bale and Lutz involving efficiency and deadweight losses to capture welfare effects of public interventions. Several qualifications apply to the usage of that methodology in the current context. Since 1985/86, internal procurement has been a much more substantive source of grains relative to food aid. The rationing system has been disbanded and the PFDS has been reoriented towards targeted channels.

There is also the technical difficulty of all grain being priced now by the DGF at economic price, thus doing away with unit subsidies. Due to these considerations, the Bale and Lutz framework is not the natural one to estimate cost-effectiveness. Instead, since targeted interventions now dominate, the framework of WGTFI and Ahmed is more suitable. We build on that framework and extend it further. In effect, we answer the question: what is the net *social* welfare gain from the operations by the DOF, whether from *procuring grains domestically*, distributing domestically-procured grain among various channels or distributing grains through either food-for-work activities or vulnerable group development programs.

In our estimate, we use distributional weights in assessing program benefits. In order to use distributional weights, we use data on average incomes of all kinds of program beneficiaries. The weights are inversely proportional to the per capita incomes of households in each beneficiary class. Based on our estimates, cost-effectiveness of the existing PFDS has improved from mid-1980s by forty percentage points. The movement towards targeted channels and away from the openly inequitable sales channels has contributed to this extremely positive development.

3. TRANSITION IN PRICE OF FOOD GRAINS IN BANGLADESH

In this section, we look at the trends in cereal prices deflated by the consumer price index (CPI) for non-food goods in Dhaka. For both grains, the annual price variability has clearly fallen. Both real-prices display statistically significant negative trends. For rice, the negative time-trend for the period 1981-2003 is 2.57% per year, and for wheat the negative growth rate is 1.76%.¹⁶

The number of months in which trend-deviations are positive during the post liberalization period is 6 *versus* 4 during the first period. There is some clustering of positive shocks in coarse rice prices in the run-up to the boro-planting season between February and May. Both intra year and inter year fluctuations in rice prices have become

¹⁶ In spite of these encouraging trends, it is important to highlight that the unit cost of rice production in Bangladesh is high compared with other countries in the region, 62% higher than Thailand in dry season (Boro) and 18% in wet season (Aman), 25% and 36% higher compared to Vietnam. Compared to the Indian states of Punjab and Andhra Pradesh, production cost is 26 to 81% higher in Bangladesh (Deb and Hossain, 2003).

more attenuated in the 1980s and especially in the 1990s compared to the 1970s. The standard error of estimate around a simple time-trend fitted to nominal rice price for the years 1973-1993 is 0.5, it is only one-third of that in the later period. The intra-year range between the highest and lowest rice prices has the following results: 1973-1980, 29.2%; 1981-1993, 17.4% and 1994-2003, 14.8%. With falling and more stable rice prices, one expects food security in Bangladesh to improve (from consumer's point of view). This expectation is not unreal as the next section argues.

4. FOOD SECURITY OUTCOMES OF POLICY INTERVENTIONS INCLUDING LIBERALIZATION IN BANGLADESH

The per-capita availability of all grains has increased in Bangladesh post-liberalization. During the period 1973-2002, rice and wheat consumption per capita has averaged 147.2 and 18 kgs respectively. Overall, food grain consumption has averaged 165.2 kgs. Government's targeted norm for the average citizen is 165 kgs a year. In the pre-liberalization period, per-capita food grain availability was 158 kgs. Thus, liberalization has positively affected food grain consumption. For food grains as a whole, variability in consumption is lower than for rice and wheat individually. Variability in overall consumption is higher post liberalization (10.3% versus 3.4%).¹⁷

Below, we use the food grain intake data by income deciles from four rounds of Surveys (HIES), 1985, 1988, 1992 and 2000 as our basis for discussing household-level

¹⁷ For rice, 6 successive negative deviations from trend during 1994 – 1999 have been followed by 4 successive positive trend deviations. It is important to remember that real grain prices had lower variability in the post-liberalization period.

food security (Table 7). Per-capita consumption of all cereals shows a declining trend between 1992 and 2000: from 185 to 170 kgs.¹⁸ Per-capita consumption of rice however does not show any trend one way or the other. Since, per-capita incomes during the same time grew at a rate of 3% and the inequality in income has shrunk, the fall in average food grain consumption could possibly be due to other changes such as dietary preferences. The distribution of rice intake has indeed improved between 1992 and 2000. The bottom 40% consumers raised their intake while the top 20% reduced it. The Gini coefficient of cereals fell from 0.08 in 1992 to 0.04 in 2000.

Having established that private sector has been largely responsible for the improvements in food security in Bangladesh, it leads us to the next question: does the private-sector compare favorably to the public-sector in the terms of efficiency?

Table 7—Rice and cereal intake by Bangladeshi households by bottom and top quintiles

Year	Rice			All cereals		
	Bottom 40% of consumers	Middle 40% of consumers	Top 20% of consumers	Bottom 40% of consumers	Middle 40% of consumers	Top 20% of consumers
1988/89	143.36	167.74	184.68	169.18	190.68	206.0
1991/92	143.4	182.3	185.8	158.6	199.2	211.05
1995/96	148.1	167.4	164.4	164.1	182.6	184.6
1999/00	156.8	167.4	164.2	161.9	173.4	181.15

Source : Household Expenditure Surveys of BBS (Various rounds).

¹⁸ While comparison of average foodgrain availability pre- and post-liberalization points at growth, data from household surveys is vague regarding growth in intake levels. There is however no doubt that the poorest 40% of the population have increased their consumption of rice.

5. ASSESSING COMPARATIVE EFFICIENCY OF PUBLIC *VERSUS* PRIVATE MARKETING OF GRAINS IN BANGLADESH

The measures that we use for comparing public and private sector efficiency are as follows: (1) unit transportation cost based on a benchmark grid of marketing routes (2) cost of transit and storage loss and (3) the marketing margin adjusted for marketing life-cycles. The benchmark grid of marketing for public sector includes 20 new districts in Bangladesh that account for the bulk of public procurement of rice and is based on the *movement program* (MP) drawn up by the DOF for rice before the onset of the procurement season. The data is based on movement of grains during 2002 from actual shipments involving 35 marketing routes.

The most important routes originate from rice-surplus districts in the North-west (, Rangpur, Bogra, Rajshahi districts). From these districts, the rice is shipped mostly to the rice-deficit districts. With the exception of greater Sylhet and Comilla, the deficit districts are in the South that is Barisal, Khulna, Chittagong, Noakhali, and Chittagong. These 35 routes accounted for nearly 75% of all rice procurement during 2002. The unit quantity-weighted transportation cost was calculated based on actual fares, and losses, financing and fixed costs in DGF distribution. For the PFDS as a whole, the distribution cost of rice on a full-cost basis is 21% of the procurement price.

There are notable similarities in the public and private sector marketing-grids for rice. Bogra and Rajshahi are the grain arteries for both the public and the private sector. For the private-sector, marketing margins range between Tk. 2020 a ton to Tk. 2620 a

ton. For the public sector the corresponding number in 2002 was Tk 2450 on average (See Table 8 for comparing the marketing spreads between private and public sector).

Table 8—Comparative marketing spreads of private trade and the DGF (All prices are Tk/ton)

Terminal Markets	Retail price in 2002	Private-sector marketing spread for rice, 2002	Marketing spread as % of farm-gate price	
			Private trade	DGF
Khulna	13000	2260	21.04	19.8
Dhaka	13220	2100	18.88	19.5
M'Singh	12950	2020	18.48	19.3
Faridpur	13240	2260	20.58	19.3
Barisal	13290	2430	22.38	21.1
Chittagong	13540	2620	20.69	22.0
Noakhali	13460	2450	22.25	20.9
Comilla	13060	2470	23.32	20.1
Sylhet	13080	2620	25.04	25.1
All	13240	2360	21.69	20.8

Source : Calculated by the authors.

As a percentage of farm-gate prices, marketing margin in private trade is slightly higher, at 21.7%.¹⁹ In comparing these margins, few considerations apply. First, DGF is much larger in terms of capitalization, scale of operations and geographical coverage. It also enjoys a more favorable regime of input prices and is an insider within regulatory and donor institutions.²⁰ The DGF maintains 5 to 7 months expected requirements. The

¹⁹ One conjecture for the falling private marketing spreads is the opening of the Jamuna bridge in 1999 that cut travel time by more than 40%. The second reason is the growing competition that is reflected in a rising number of merchants.

²⁰ In 2001, the DGF implemented construction of modern storage depots throughout the country, mostly funded by food-aid donors. These have possibly lowered the storage costs of the DGF while leaving the costs of private storage unaffected.

rice stocks of the entire private sector are for no more than two-five weeks requirements. The DGF is also favored at the lending windows of state-owned banks.

Finally, an effect that has not been discussed in the literature and that we allude to is the detrimental effect of the government stocks on the on the private stocks. The conjecture is that the excessive stocks with the government have a potentially dampening effect on the expected prices that in turn shortens the storage tenure of the private traders. In an anticipated equilibrium, expected future prices lead to a dampening of the price in the current period itself. In that sense, the procurement activity of the government aimed at securing price support for the farmers can work at cross purposes.

Since the government's procurement policy is likely to be working at cross purposes and private sector is nearly as efficient in spite of the playing field not being level, there is a need to reform the procurement system by limiting it to be a price support policy and not a persistent source of stocks. Also, the PFDS continues to involve a significant drain on public resources and changes are due on that front.

Government's involvement with procurement is commonly argued to be excessive. In Bangladesh, the boro rice crop bears the brunt of the procurement drive, much of it happening between the wet months of May through September. Monthly indent for rice for sales channels have fallen to between 60 and 80 thousand MT on an average. During the boro procurement season, the DGF has on average bought 150 thousand MT. During the wet season there is no way the government can pump out rice through the FFW channel. The FFW work typically is a dry-season activity, done during December through April. Public rice stocks thus accumulate and eventually decay to be

of sub-standard quality. Meanwhile new procurement season arrives leading to a reinforcement of the stocks.

Since 94% of the consumer demand is met by the market, market prices should be the basis of the calculation of subsidies. We extend the results from two recent IFPRI studies, Dorosh and Farid (2003) and Ahmed et al. (2004) in assessing the costs and benefits of the PFDS operations. With estimates based on market prices, the level of consumer subsidies during 2003/2004 was Tk 7.3 billion. This estimate is about 30% higher than in 2001,²¹ largely because market prices during 2003/2004 were higher, while all administered prices had not been raised. The producer subsidy is estimated at Tk 1.4 billion, only 64% that of the level in 2001. This is almost entirely because of the fact that despite its best attempts, the government was virtually unable to procure any wheat in 2003/2004.

IFPRI's recent research shows that even within current pricing and distributional outcomes, the government can run the system at a lower cost. When net stock increases to 0.8 million tonnes, keeping the distribution level identical to the base scenario, the amount of old stock increases from 332 tonnes to 908 tonnes. This leads to a loss with a benefit/cost ratio equal to -14%. With the closure of FFE (about 350 thousand tonnes) and downsizing of the PFDS operation, such as the FFW program (more than 200

²¹ Rice prices globally were rising during 2003 and 2004, in a process of rebounding from the historical lows reached during 2000 and 2001. Thus for instance the price of benchmark Thai 100% white rice during 2003 and 2004 were, respectively, US dollar 240 and 280 per MT, while the corresponding prices during 2000 and 2001 were US dollars 180 and 195. Global stocks had also made a marked increase during 2003/04 compared with 2000/01. Unsurprisingly, prices in Bangladesh too were much higher during 2003/2004 than during either of the earlier years cited in the foregoing.

thousand tonnes) in 2002, the ideal PFDS stock level and its distribution should be 0.6 and 1.35 million tonnes, respectively. Ahmed et al. (2004) reported that the benefit-cost ratio of managing 0.6 million tonnes of food grain could be as high as 74%, as against a negative benefit-cost ratio of –14%. The implicit cost of holding greater stock is substantially higher, about \$15 million at 2002 exchange rate.

To summarize, as market prices in Bangladesh stage a comeback into the 2004/2005 from the lows reached during 2000 and 2001, the true burden of the country's PFDS will undoubtedly rise. Importantly, the prices are most likely to rise even further due to the prospective effects of the Doha Round.

6. ASSESSING MULTILATERAL TRADE LIBERALIZATION EFFECT ON GLOBAL FOOD GRAIN PRICES

This section assesses the likely impact of the Doha Round, if successfully concluded, on food security in Bangladesh. A multi-market model that distinguishes several household types is used to study the impacts on real incomes and food consumption of the poor in Bangladesh due to anticipated changes in world price of rice and wheat from multilateral trade liberalization under the Doha Round. This analysis is supplemented with a review of a recent study that analyzes the impacts of trade liberalization on poverty in Bangladesh using a computable general equilibrium (CGE) model.

6.1 MULTI-MARKET MODEL ANALYSIS

We employ a multi-market (MM) model originally developed in 1994 (Dorosh 1994; Dorosh and Haggblade 1995). This model distinguishes 13 commodities: rice, wheat, pulses, fruits and vegetables, potatoes, onions, fish, meat, milk, oils, sugar, other food, and nonfoods. It also distinguishes five household types: urban poor, urban nonpoor, rural landless, rural small farm, and rural large farm. The model differentiates net-producers (large farmers) from net consumers, allowing for differential consumption responses to price shocks. The demand side for each market distinguishes between consumption out of in-kind and cash income with elasticities taken from Ahmed (1993) and Goletti (1993).

On the supply side, the model allows endogenous production responses to output price using supply elasticities estimated by Rahman and Yunus (1993). Price formation in the model differs for traded and nontraded commodities. For traded commodities, the CIF import price sets the domestic price level with net imports adjusting to clear the market. For nontraded commodities, prices adjust to equilibrate domestic production, consumption, and changes in stocks. For details about the model structure, the baseline, the standard-of-living in Bangladesh's rural and urban areas for the five underlying economic classes in the model see Goletti (1993), Dorosh (1994), Dorosh and Haggblade (1995).

We continue to use the same set of elasticities as in the original model, but do update some exogenous parameters. We run simulations wherein the world price of rice and wheat are shocked to reflect the effect of multilateral trade reforms. A pertinent issue here is the extent to which the world price of rice and wheat are expected to change following multilateral trade reforms. A recent study by the United States Department of Agriculture (USDA) using global computable general equilibrium models found that with full liberalization under the Doha Round, the world rice price would change by 10.1% and by 18.1% for wheat. Since these values are based on a model that does not admit of positive supply response to initial price increases, and negative aggregate-demand response, these estimates may well be an upper bound..²² The need to carry out

²²All the more so, because WTO bound tariffs will offer quite a bit of flexibility, even under the total multilateral liberalization.

alternative sets of model simulation based on both the upper and lower bounds is imperative.

Accordingly, we shock the multi-market model of Bangladesh with upper and lower bounds of the estimates of the effect of multilateral trade liberalization on world prices. Table 9 reports the results of the simulations on real incomes and foodgrain consumption of rural and urban poor, measured in kcal/day in Bangladesh.

Results indicate that the real incomes fall except for the most well-off rural income class across all simulations. At the upper bound increase in world price of both rice and wheat (Simulation 5), real incomes of the rural large farm households rise by about 1.5%, while the urban poor and rural landless lose nearly 2% of their real incomes. This follows from large farmers being net-producers for whom the increase in domestic price in line with increase in world prices raises their revenues. The increase in world price of wheat has much larger effect on real incomes than the increase in world price of rice (Simulations 1 and 3). These changes (rise / loss) in the real income across household types are roughly halved when the increase in the world prices are at their lower bound (Simulation 6). In terms of calorie intake, however, all households witness a decline. Expectedly, the decline is highest amongst urban poor and rural landless, by 65 and 40 calories per capita per day, respectively.

Table 9—Simulations 1-6, higher world grain prices with liberalized trade

	Simulation 1	Simulation 2	Simulation 3	Simulation 4	Simulation 5	Simulation 6
Real Incomes						
Urban poor	-0.922	-0.45	-1.544	-0.62	-1.977	-0.93
Urban Nonpoor	-0.4655	-0.225	-1.08	-0.29	-1.25	-0.61
Rural Landless	-0.79	-0.38	-1.357	-0.53	-1.836	-0.89
Rural Small Farm	-0.17	-0.09	-0.506	-0.22	-0.576	-0.29
Rural Large Farm	0.91	0.48	0.987	0.25	1.47	0.73
Calories (absolute change, kcal / capita / day)						
Urban poor	-13.7	-7.0	-51.8	-0.23	-65.1	-27.0
Urban Nonpoor	-7.84	-4.0	0.0	0.0	-7.84	-0.39
Rural Landless	-13.0	-7.2	-28.1	-0.12	-40.2	-21.5
Rural Small Farm	-8.16	-3.80	7.5	3.0	-1.1	-0.57
Rural Large Farm	-9.215	-4.4	-20.07	-9.1	-28.8	-11.0

Note: Simulation 1 – 10% increase in world price of rice.

Simulation 2 – 5% increase in world price of rice.

Simulation 3 – 18% increase in world price of wheat.

Simulation 4 – 7% increase in world price of wheat.

Simulation 5 – 10% and 18% increase in world price of rice and wheat, respectively.

Simulation 6 – 5% and 7% increase in world price of rice and wheat, respectively.

The above results capture the impact of trade liberalization only in rice and wheat.

The Doha round has a more ambitious agenda covering all agriculture and also non-agriculture including services. The multi-market model cannot capture the impact of more widespread trade reforms, both unilaterally by Bangladesh and multilaterally. An analytical framework that is typically used for such analysis is the computable general equilibrium (CGE) model. Next, we summarize a recent study by Annabi et al. (2005) that has examined the impacts of trade liberalization on poverty in Bangladesh using a CGE model.

6.2 RESULTS FROM COMPUTABLE GENERAL EQUILIBRIUM ANALYSIS

The study by Annabi et al. (2005) uses a sequential dynamic CGE model based on the social accounting matrix (SAM) for the year 1999-2000. The model, solved over a 20

period time horizon, generates “steady state” paths that help in quantifying both the short run (mainly allocative effects) and long-run (both allocative and factor accumulation effects) impacts of trade liberalization. The study finds that trade liberalization could have different and often opposite impacts in the short- and in the long-run, clearly demonstrating the need for analyzing these effects in a dynamic framework.

The entire model can be viewed as a series of static CGE models that are linked across periods by updating procedures for various endogenous and exogenous variables. The model distinguishes nine household categories, five in the rural areas based on occupation and land-ownership status (Landless, Marginal Farmer, Small Farmer, Large Farmer, Non-agricultural) and four in the urban areas based on education level (Illiterate, Low-Educated, Medium-Educated, High-Educated).

The other agents in the model are firms (one representative firm per sector), the government and the rest of the world. The model distinguishes four types of primary factors, skilled and unskilled labor, agricultural and non-agricultural capital, and assumes full mobility for both types of labor across the fifteen commodity producing sectors in the model. Production is modeled as a nested Leontief-CES structure that generates demands for the primary factors and intermediate inputs, which are further distinguished between domestically produced and imported ones. Households receive income from factor payments, and transfers from firms, government and rest of world. They pay direct taxes, save a fixed proportion of their disposable income, and their commodity demands are represented through a linear expenditure system. The model allows for imperfect substitutability of domestically produced goods and their imported counterparts and

between exports and local sales for the domestically produced goods. Government levies direct tax on households and indirect tax on firms and on imports. Its expenditure includes consumption of goods and services and transfers. Government budget equilibrium is met by a neutral tax adjustment. The nominal exchange rate is the numeraire in each period. For each period, the population (labour supply), government consumption and savings, and current account balance are fixed, and these variables are updated exogenously from one period to the next. Capital stock, on the other hand is updated endogenously based on a investment demand function.

Annabi et al. (2005) study the impact of a unilateral trade liberalization by Bangladesh and also the case when reforms in Bangladesh are a part of a process of multilateral trade liberalization.²³ The main findings are as follows:

- Unilateral elimination of tariffs by Bangladesh has a negative impact on both GDP and welfare in the short-run, but a strong positive impact on both in the long-run.
- Tariff elimination results in strong reductions in domestic import prices, particularly in the case of petroleum, other industry, livestock, forestry, chemicals and leather (in excess of 15%). There is no clear agriculture-industry distinction, as both these sectors contain several sub-sectors with high and low initial tariff rates.

²³ They also study three other scenarios (i) the Doha round trade reforms that allow for reductions in tariffs, subsidies and domestic support in the rest of world along with special and differentiated treatment of Bangladesh (an LDC), (ii) full trade liberalisation in the rest of world, and (iii) increase in remittances into Bangladesh reflecting increased international mobility of labor. These scenarios address issues that are outside the scope of interest here.

- Import competition forces a reduction in domestic prices as well, and consequently there is a fall in overall consumer prices both for rural and urban households (ranging between 5.5% to 24.6% in the long-run).
- Firms across sectors respond differently to the decline in domestic prices. In sectors with high initial tariffs such as petroleum, chemicals, machinery, and other industry, there is a contraction of output (7.8% to 58.8% in the long-run). On the other hand in sectors that had low initial tariffs such as commercial crops, rice-milling, and ready-made garments, firms reorient their production towards the export market resulting in an expansion of both exports and output (1.2% to 19.4% in the long-run).
- Over time there is reallocation of non-agricultural capital and labor to the textiles/garments sector away from the other manufacturing sectors, with relatively little movement within the agricultural sectors. As a result, the above impacts (increase/decrease) on imports, exports and output are stronger in the long-run than in the short-run.
- The decline in product prices results in a decline in factor prices as well (5.2% to 27.8% in the long-run), though the decline in the long-run is less than in the short-run. Between labor and capital, the returns to capital fall more than for labor due to the contraction of several industrial sectors. Within labor, the wage rate for unskilled labor declines less than for skilled labor due to the expansion of labor-intensive textile-garments sector.

- The decline in factor returns results in a fall in the nominal income of households (5.2% to 6.8% in the long-run), less so in the long-run than in the short-run. The decline is smallest amongst the poorest households (urban-illiterate, urban-low educated, rural-landless and rural-marginal), who get mostly unskilled wages. Households that get income from skilled labor and non-agricultural capital (Medium- and High-educated urban households, and non-agricultural rural households) are the biggest losers.
- In terms of real consumption, all households suffer a decline in the short-run (between 0.1% to 0.7%) as nominal income falls more than consumer prices. In the long-run, however, all households gain (0.6% to 1.8%) with the poorest households emerging as the biggest winners. Welfare measures too show similar movements across households, and between the short- and long-run.
- On expected lines, all measures of poverty show that unilateral trade liberalization increases poverty in the short-run while in the long-run it declines for all household types.
- The scenario where trade reforms are part of global (multilateral) reforms; trade reforms by Bangladesh are more important for Bangladesh than reforms in the rest-of-world. The impacts at the macro level in terms of GDP and welfare are similar in nature, but the adverse impacts on welfare and poverty are higher in the short-run, while the long-run gains are somewhat lower. Amongst households, large farmers emerge as the principal beneficiaries of free world trade.

7. CONCLUSION

Bangladesh's food-policy between 1980 and 2000 has witnessed momentous changes. However, there were changes that occurred outside of food policy which were extremely relevant for creating the right initial conditions for subsequent policy changes. One change was the plant-breeding research in rice. The second was the development of physical infrastructure. In the backdrop of these developments, several far reaching changes occurred in food policy. To begin with, there was the abandoning of the inequitable food grains distribution channels. Importantly, the government faced no backlash for such belt-tightening. Consequently, currently more than three-quarters of all food grains publicly distributed accrues to the poor. Following this, the government traversed a major psychological barrier by legalizing private imports of fertilizer in 1992 and then of food grains in 1993.

As government provided the environment with infrastructure and policy, markets swung into action. Irrigated acreage rose sharply. Food grain production and availability per capita and yields rose as well. Consequently, the import dependency for food grains fell significantly from 12% in 1980 to 5.5% in 2004.

The cropping-pattern effect led to a two-peak harvest seasonality pattern. The advent of an automatic stabilizer became a foil to undue production and harvest variability raising the degree of economic confidence of the peasantry in a rice-dominated rural economy. HYV rice was also more intensive in cash costs. This translated into a need for raising marketed surplus. The size of the marketed rice surplus over the last quarter century grew at twice the rate of output growth. Small and marginal farmers were

very much a part of this propitious development. Selling seasonality was moreover evenly spread over the months in a crop-year i.e. there was no distress selling.

This marketing revolution was made possible by both the technology and the role of the government in building infrastructure. Private sector delivered yet again, importing large quantities of rice after a devastating flood in 1998. A completely new collection of traders, with no overlap with merchants in rice milling and wholesaling, entered the market. The trademark of these new breed of traders was their network of market contacts in important source countries, especially India.

Trading very soon became extremely competitive given the low entry barriers. Most of them opened Letters of Credit (L/C) for fairly small quantities of rice to be imported. They also invested in stocks for the shortest possible time. They also imported at a relatively short notice. Liberalization led to a nearly complete replacement of the public imports by the private.

The public sector too responded to the policy transition. Statutory food grain subsidies were abolished. The proportion of market supply sourced from the PFDS fell from 12% in the early 1980s to 6% in the early 2000s. Prioritization of poverty reduction led to a significant pro-poor focus of the PFDS. Distribution sensitive estimates of cost-effectiveness show an increase from a low of 55% in the mid-1980s to 90% in 1999/2000. This change resulted from a realignment of the PFDS from an inequitable, urban-leaning to targeted rural-leaning channels, such as the Food-for-Works (FFW) and Vulnerable Group Development (VGD) programs.

Public procurement has replaced imports as the mainstay for public distribution. The procurement policy is one area where the government is yet to bring in substantial reform. Out of a marketed surplus of nearly 15 MMT of rice, recent procurement has been less than 6%. The bulk of the procurement takes place during the wet boro season, when off take of grains from the PFDS becomes sluggish. The rotation of stocks thus leads to overstocking. Based on estimates from different studies the government stocks are excessive.

The outcomes from liberalization have been impressive on several fronts. Real prices (nominal price relative to the price index) of both grains fell markedly. The seasonal fluctuations have also been more muted. The range between the seasonal high and seasonal low narrowed between the 1980s and the 2000s. Secondary evidence also shows greater spatial integration of markets post liberalization. The bottom 40% of the population closed the gap in per-capita rice consumption *vis-à-vis* the top 20%. In light of favorable outcomes from the private sector, estimates show that the public and the private sectors are nearly identically efficient.

Rolling back border protection and phasing out all export subsidies is estimated to raise world rice price by about 22% by 2013, and wheat prices by a little over 10%. It is shown using a multi-market model that these shocks are likely to translate into falling real incomes, food grain intake and calorie consumption by two most vulnerable groups in Bangladesh, the urban poor and the rural landless. It is also shown that real incomes of the large farmers increase as a result of trade liberalization

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